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ABSTRACT

During the 1979-80 school year, the National Assessment of Educational Progress (NAEP) surveyed approximately 29,000 nine-year-old students regarding attitudes and achievement in reading and literature. Findings from this study were used for an analysis of the relationship between reading achievement and television viewing. The following background questions were selected for analysis: (1) How much television did you watch yesterday? (2) Is English the language spoken most often in your home? (3) Does your family get a newspaper regularly? (4) Are there more than 25 books in your home? (5) Is there an encyclopedia in your home? and (6) Did your father graduate from college or university? Results indicated that there was a curvilinear relationship between amount of viewing and achievement, in which moderate amounts of viewing were associated with higher achievement. There was a threshold amount of viewing (five or six hours per day) beyond which there were sharp decreases in achievement. This curvilinear relationship interacted with social class to result in a mainstreaming effect. That is, achievement of disadvantaged students increased more with moderate amounts of viewing and decreased less with large amounts than that of advantaged students. The consequence of this was a lessening of the differences in achievement between advantaged and disadvantaged students with greater amounts of viewing. (Author/HOD)

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Television and Reading Achievement: A Secondary Analysis of Data from the 1979-80 National Assessment of Educational Progress

by

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ABSTRACT

Findings from a study of reading achievement and television viewing are reported. Data from the 1979-80 National Assessment of Educational Progress assessment of reading and literature were used. There was a curvilinear relationship between amount of viewing and achievement, in which moderate amounts of viewing were associated with higher achievment. There was a threshold amount of viewing, of five to six hours per day, beyond which there were sharp decreases in achievement. This curivilinear relationship interacted with social class to result in a mainstreaming effect. That is, achievement of disadvantaged students increased more with moderate amounts of viewing and decreased less with large amounts than that of advantaged students. The consequence of this was a lessening of the differences in achievement between advantaged and disadvantaged students with greater amounts of viewing.

INTRODUCTION

T. H. Huxley remarked that the great tragedy of science is the slaying of a beautiful hypothesis by an ugly fact. An hypothesis that has tempted many researchers on television is that increased viewing causes lower academic achievement. Results have not supported this simply stated hypothesis. There does appear to be a relationship, but it is complex.[1]

The very pervasiveness that makes television an attractive research topic also makes it difficult to study. This is partly the result of difficulty in applying experimental or statistical controls for program content, amount of viewing and theoretically interesting background variables, such as social class and intelligence. Longitudinal studies which permit the monitoring of academic growth and viewing habits over a period of years, (Bachen, Roberts and Hornby, 1982; Morgan and Gross, 1981) are rare. Small sample size and the consequent lack of statistical

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[1] This paper was written for presentation at the annual meeting of the American Educational Research Association, Montreal, April, 1983. Thanks are owed to Dr. Dale Carlson, Director of the California Assessment Program for his encouragement and to many individuals of the Educational Commission of the States for helpful comments regarding use of the NAEP data tapes. The views expressed here are not necessarily those of the California Department of Education or of the National Assessment of Educational Progress.

power appear to have been a limiting factor in some studies, as well.

Roberts and Bachen (1981) have extensively reviewed recent television research, the greater part of which is dedicated to social issues. Gerbner, Gross, Morgan and Signorielli (1980, 1982) have developed and tested a comprehensive theory of the social effects of television. A construct they use to account for differences between groups of viewers is mainstreaming. This refers to a tendency for for television to cultivate a commonality of outlooks. Heavier viewing diminishes differences related to social factors. A question of interest here is the extent to which this applies to school achievement. Social class is strongly related to group achievement. To what extent is this relationship, and others like it, modified by viewing of television?

Given the attraction of televison for young people, there has been an increasing amount research on the relationship between televison and academic achievement. Salomon (1979) describes experimental and theoretical research on the relationship between visual media and learning. Several recent and extensive reviews further document current interest. Hornik's (1981) review documented a modest effect of viewing on reading achievement. Effects were greater for bright children, but diminished after statistically controlling for intelligence. Hornik advocated the

examination of specific causal mechanisms linking television and achievement, for example, "displacement." Briefly stated, time spent watching television is not spent reading, and lessened practice reading could result in lower achievement. Morgan and Gross (1981) found a modest negative relationship between viewing and achievement. Heavier viewing was associated with lower intelligence and lower social class. For lower IQ students, especially girls, there was a positive association between viewing and achievement. They cited two reasons for the modest correlations. One was the curvilinear relationship between amount of viewing and achievement. Another reason for small correlations had to do with subgroup differences, e.g. stronger effects on high IQ than on low IQ students. Williams, Haertel, Haertel and Walberg (1982) synthesized the results of 23 different studies spanning the years 1954-1980. They found a median correlation of -.06 between amount of viewing and achievement, and a significantly greater impact for high IQ students.

Two studies published by the California Department of Education in 1980 and 1981 documented negative effects of viewing. The 1980 study included over one half million sixth and twelfth graders. Decreases in reading, written expression and mathematics achievement were associated with increased viewing. Data from the 1981 study were taken from a detailed survey of a representative sample of about 12,000

sixth graders. Students with high socioeconomic status or who rated schoolwork as easy had the largest and most consistent decreases in achievement with increased viewing. Achievement of low socioeconomic students improved with moderate amounts of viewing. Scores declined sharply with large amounts of viewing for all groups examined. Heavy viewers tended to watch light entertainment, to have lower socioeconomic status, lower achievement, and to be involved in a family viewing habit. Light viewers tended to watch public affairs and news shows, to have higher socioeconomic status, higher achievement, and experienced a stricter home television environment.

Method

Data source. The National Assessment of Educational Progress (NAEP) conducts surveys of the knowledge, skills and attitudes of students under contract from the United States Department of Education. During the 1979-80 school year about 29,000 nine year old students were surveyed regarding attitudes and achievement in reading and literature. A public use data tape containing all original item and background variable responses and full documentation was obtained from NAEP.

For each learning area that is assessed NAEP asks consultants to develop objectives that define the subject area and create guidelines for exercise writers. Documentation of these objectives can be found in NAEP

(1981). The relative weights of objectives used to guide the 1979-80 reading assessment of nine year olds were: valuing 10 %; comprehension 45 %; responding 30 %; study skills 10 %; and general background information 5 %. These were specified in detail, items were written, revised and field-tested. Test questions selected for the assessment were allocated among eleven booklets. Each booklet was designed to contain items of varying difficulty, and was timed to require no more than 45 minutes for completion. This included 30-35 minutes for exercises and 10-15 minutes of introductory material, instructions and background questions. The booklets were administered to groups of 16-25 students under standardized conditions.

Sample. NAEP uses a deeply stratified three-stage national probability sample design with oversampling of low income and rural areas. Primary sampling units are counties or groups of counties meeting minimum size requirements. These are stratified by region and size of community. Public and private schools are randomly selected in the second stage of sampling, and individuals are randomly selected in the third stage. The selection probability of each individual is computed and its reciprocal, adjusted for nonresponse, is used to weight each response in all statistical calculations.

Eighty-three primary sampling units containing 560 participating schools were selected. Participation in the

assessment was voluntary with 94.5 % of eligible schools and 90.1 % of selected students in those schools cooperating. An average of 2,646 students responded to each of the eleven booklets.

Analyses. Percent correct scores were calculated by dividing each student's total number of correct achievement test items by the total number possible in the relevant booklet. Weighted means were obtained, using NAEP supplied weights, by aggregating scores across the eleven booklets. Percents of students in each breakdown category were based on weighted figures, as well. For the correlational analyses student percent correct scores were converted, independently for each booklet, into normal scores, using the SAS (1979) RANK procedure. The resulting scores appear normally distributed. The procedure was suggested by NAEP as a way to compensate for the lack of exact parallelism among the eleven booklets.

Variables were selected for analysis on the basis of logical relevance to reading achievement and after preliminary studies to verify their statistical relevance to both reading achievement and television viewing. Those background questions selected for analysis follow.

- How much television did you watch yesterday?
- Is English the language spoken most often in your home?
- Does your family get a newspaper regularly?
- Are there more than 25 books in your home?

- Is there an encyclopedia in your home?
- Did your father graduate from college or university?

Results

There was a common pattern of results for nearly all variables examined. This included an increase in achievement for viewing up to three or four hours, and a decrease for viewing more than four or five hours. Sharp decreases in achievement were associated with viewing over six hours. Differences in achievement between groups tended to diminish with greater amounts of viewing.

A plot of reading achievement by amount of viewing is shown in Figure 1. Average achievement is relatively low for less than one hour of viewing, increases to a maximum at two to three hours, and decreases for four or more hours. The decrease is relatively sharper for more than six hours. A relatively large group of students, 19 percent, reported watching more than six hours.

Achievement results broken down by sex are shown in Figure 2. There were 50.6 percent girls with an average score of 66.6 percent, compared to 49.4 percent boys with an average score of 62.6 percent. Achievement for both groups increased for up to two or three hours per day of viewing and decreased sharply with larger amounts. Among students who reported watching no television the previous day the difference in achievement between boys and girls was 3.1 points. This was close to the 2.9 point difference for those students who watched more than six hours.

Results for the Question, "Is English the language spoken most often in your home?," are shown in Figure 3. There were 83.3 percent with an average score of 67.4 who responded yes, compared to 16.7 percent with an average score of 53.4 who responded no. There were increases in achievement for up to three hours of viewing for those who reported using English in the home. Students for whom English was not the main language had increases in achievement with up to five hours of viewing. The difference in achievement between the two groups was 16.9 points for those who watched no television the night before, compared to 10.5 points for those who watched more than six hours per day.

Results for the question, "Does your family get a newspaper regularly?," are shown in Figure 4. There were 79.5 percent with an average score of 66.3 responding yes, and 20.5 percent with an average test score of 60.9 responding no. For both groups achievement improved with viewing up to three hours per day, and decreased with greater amounts of viewing. Decreases in achievement appear to be sharper and begin at a lower threshold of amount of viewing for those who have home access to newspapers. Among students who report watching no television the difference in achievement means was 6.6 points. This difference narrowed to 3.6 points for those reporting more than six hours of viewing.

Results for the question, "Are there more than 25 books in your home?," are shown in Figure 5. There were 91.7 percent with an average test score of 66.4 who responded yes, compared to 8.3 percent with an average test score of 52.2 who responded no. Average achievement for both groups increased for up to three hours of viewing, and decreased with greater amounts. The difference in average achievement between the two groups was 16.3 points for those who watched no television the night before and 11.1 points for viewing over six hours.

Results for the question, "Is there an encyclopedia in your home?," are shown in Figure 6. There were 80.1 percent with an average test score of 66.1 who responded yes, compared to 19.9 percent with an average test score of 61.0 who responded no. Achievement for both groups increased with viewing up to three hours per day and decreased with greater amounts of viewing . The difference in achievement between the two groups was 6.5 points among students who reported watching no television, compared to 2.0 points for those who reported watching more than six hours.

Results for the question, "Did your father graduate from a college or university?," are shown in Figure 7. There were 65.9 percent with an average test score of 67.8 who responded yes, compared to 34.1 percent with an average test score of 65.6 who responded no. Among students who responded yes achievement increased with up to three hours

of viewing per day. Among students who responded no the maximum achievement score was at the two hour point with relatively small declines at the three, four and five hour points. There was a sharp decline at the six hour point. Average achievement was virtually identical for the two groups among students who watched more than six hours, compared to a difference of 2.6 points for students who reported watching no television.

Correlations among selected variables are shown in Table 1. The variable labeled "access" is the sum of responses to the questions' "Are there more than 25 books in your home?," "Is there an ecyclopedia in your home?," and "Does your family get a newspaper regularly?" All correlations greater than .02 are significant, ($p < .01$). Correlations are based on different numbers of students because of non-response to some questions. The correlation between reading achievement and amount of viewing is a relatively modest .05, which is likely the result of the curvilinear relationship between these two variables. The largest correlations with reading achievement were obtained with "access", speaking English in the home, and sex.

The multiple regression analysis shown in Table 2 took account of curvilinearity by including the square of amount of viewing as a predictor. Standardized b values are reported to facilitate comparisons of the relative importance of the predictors. All variables contributed

significantly to the prediction and the weights for amount of viewing and its square were larger than others. The value of R-square, .11, was relatively modest.

Discussion

One puzzling characteristic of all groups studied was the relatively low achievement for students who reported watching little or no television. Presumably the less time spent watching television the more time would be available for more academically stimulating acitivies, and the higher achievement would be. There is, however, little in the results to explain the low achievement of these students. One can hypothesize that expected improvements in achievement would hinge on the academically constructive use of available spare time. In addition, one can speculate that television, for better or worse, has become an integral part of western life and culture. To be substantially cut off from television may make communication with peers difficult, especially for young children. This, in turn, could have a negative effect on motivation and achievement in school. Certainly, this phenomenon deserves further study.

All the subgroups studied showed evidence of a curvilinear relationship between amount of viewing and achievement. Common features of plots were low levels of achievement associated with low amounts of viewing, increasing achievement with viewing of two to three hours,

and decreases in achievement with more viewing. The curvilinearity is similar to that found by Morgan and Gross and in the two California studies, and helps to explain the low correlations.

One implication of the curvilinear relationship is that moderate amounts of viewing are associated with improvements in achievement. These improvements do not appear to be the same for all groups studied. The graphs suggest that students who would be expected to perform better, (i.e. those with regular access to a newspaper, who speak English in the home, who have access to an encyclopedia or other books, and whose fathers' have a college education), show smaller gains in achievement with moderate amounts of viewing than do less advantaged students. Furthermore, those less advantaged students, who would be expected to do less well, appear to have smaller decreases in achievement associated with greater amounts of viewing. For example, those students who reported that their fathers' were not college graduates had a relatively smaller decrease in achievement with larger amounts of viewing than did the other group. The trend is particularly vivid in this case.

This asymmetry (greater gains and smaller losses for the less advantaged groups) can be interpreted as evidence for mainstreaming. The one variable examined that was not related to social class, sex, did not show a narrowing of the achievement gap between the two groups with larger

amounts of viewing. Logically, the other variables, having to do with material possessions, educational status and English language fluency, are related to social class. Plots for each of these variables did show a narrowing of the gap with greater amounts of viewing. These results are consistent with the findings of Gerbner, Gross, Morgan and Signorielli, of the California studies, of Hornik, and of Morgan and Gross.

More affluent homes are likely to contain books, magazines, stimulating games, and parents who encourage their children to read, do homework and do well in school. The more time spent watching television in these homes, the less time could be spent in activities that sharpen skills relevant to success in school. Television would be a less academically stimulating activity than other options often found in such homes. Although there could be some benefits associated with television, one would expect the negative effects to show up at a lower threshold amount of viewing than for disadvantaged students. Less affluent homes would be less likely to contain books, magazines and intellectually stimulating activities. This environment offers fewer academically constructive activities to be displaced by television. Compared to what is available, television would be relatively stimulating, providing new ideas, vicarious experiences and new vocabulary. Television for these students translates into greater academic

improvement, at least when in moderation, than for more advantaged students.

There were relatively sharp decreases in achievement associated with large amounts of viewing for all groups examined. Five to six hours of viewing tended to be the threshold of this decrease. Similar results were found in the California studies, and are suggested in the findings of Williams, Haertel, Haertel and Walberg. Whatever the benefits of moderate amounts of viewing, these disappear with larger amounts. With moderate amounts of viewing there may be a tradeoff between the learning opportunities presented by television and the alternatives that may be available to individual students. Excessive viewing, by contrast, may be cutting into minimal conditions needed for success in school, e.g. getting adequate rest and doing a minimum of homework. The percent of students reporting that they viewed more than six hours the night before is nearly one-fifth the sample. This is not a small group. They appear to have serious problems with achievement, and television appears to be contributing directly to these problems.

The results of the correlational analyses confirm that amount of viewing is a statistically significant predictor of achievement. Although the correlation between amount of viewing and achievement was relatively low, the corresponding standardized b values were more substantial.

This indicates that even after other variables describing the home environment are taken into account amount of viewing has an effect on achievement.

The interpretation of this correlational data requires several cautions. One is the pronounced curvilinearity found in this study. Pearson correlations presume a linear relationship, and therefore are not a very good measure of the strength of relationship here. Another complicating factor is that the variables included here are not accounting for a very large percentage of the variance in achievement. To more fully understand the relationship between amount of viewing and achievement it would be necessary to measure other variables which are logically relevant to the situation. For instance, it would be very helpful to know how students spend their spare time, and what parents' attitudes toward television and school achievement are.

Conclusions

The relationship between amount of viewing and achievement is not simple. This study does not purport to demonstrate a causal relationship between these two variables. Hornik has noted that such a demonstration would require the development of an explicit theoretical model. Strict experimental tests, requiring random assignment of subjects to treatment groups, and statistical control requiring measurement of all relevant background variables

are needed. Even then, experimental studies are criticized for artificially manipulating situations and the use of statistical control is criticized for overlooking some important but difficult to measure variable. Given the difficulty of television research it appears that the demonstration of a truly causal relationship must await more sophisticated social research methods.

Despite these limitations and caveats the results of this study are striking, especially when combined with similar outcomes of other researchers There appears to be a threshold amount of viewing, beyond which television has a striking negative effect on achievement, and which is not easily explained by other variables. There is a curvilinear relationship between amount of viewing and achievement, in which moderate amounts of viewing are associated with higher achievement. Finally, this curvilinear relationship interacts with social class to result in a mainstreaming effect. Achievement of disadvantaged students increases more with moderate amounts of viewing and decreases less with large amounts than that of advantaged students.

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TABLE 1

Correlations for Selected Variables

VARIABLE	READING	TELEVISION	ACCESS	SPKENGLISH	SEX	FCLGRAD
COUNT	26339	24681	22966	25346	26455	14731
READING	1.00	0.05	0.24	0.30	0.13	0.08
TELEVISION	0.05	1.00	0.02	0.03	0.04	0.09
ACCESS	0.24	0.02	1.00	0.14	-0.00	0.15
SPKENGLISH	0.30	0.03	0.14	1.00	0.05	0.04
SEX	0.13	0.04	-0.00	0.05	1.00	-0.03
FCLGRAD	0.08	0.09	0.15	0.04	-0.03	1.00

TABLE 2

Multiple Regression Analysis of Selected Variables

R-SQUARE 0.11

VARIABLE	PARAMETER ESTIMATE	PROB>|T|
INTERCEPT	1.26	0.0001
TELEVISION	-0.13	0.0001
TV_SQUARED	-0.02	0.0001
ACCESS	0.21	0.0001
SPKENGLISH	0.59	0.0001
SEX	0.20	0.0001
FCLGRAD	0.05	0.0064

STANDARDIZED B VALUES

TELEVISION	-0.32
TV_SQUARED	-0.39
ACCESS	0.15
SPKENGLISH	0.23
SEX	0.11
FCLGRAD	0.02

Figure 1

PLOT OF READING ACHIEVEMENT BROKEN DOWN BY AMOUNT OF VIEWING

TV	PERCENT	READING
NONE	8.3	63.4
< ONE	13.3	63.8
ONE	10.8	63.2
TWO	14.1	67.8
THREE	13.1	67.8
FOUR	13.2	66.3
FIVE	8.1	65.0
> SIX	19.0	60.6

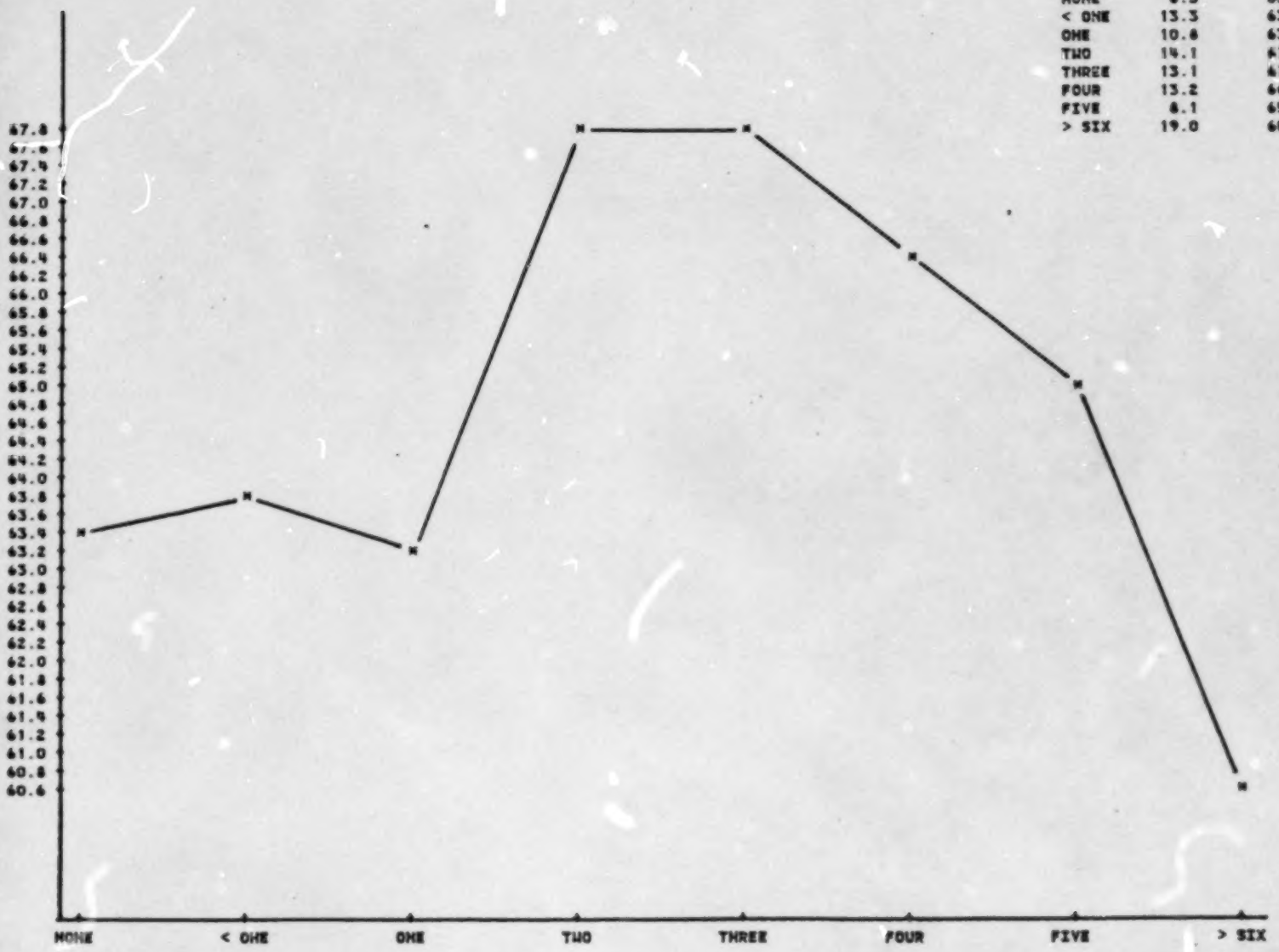
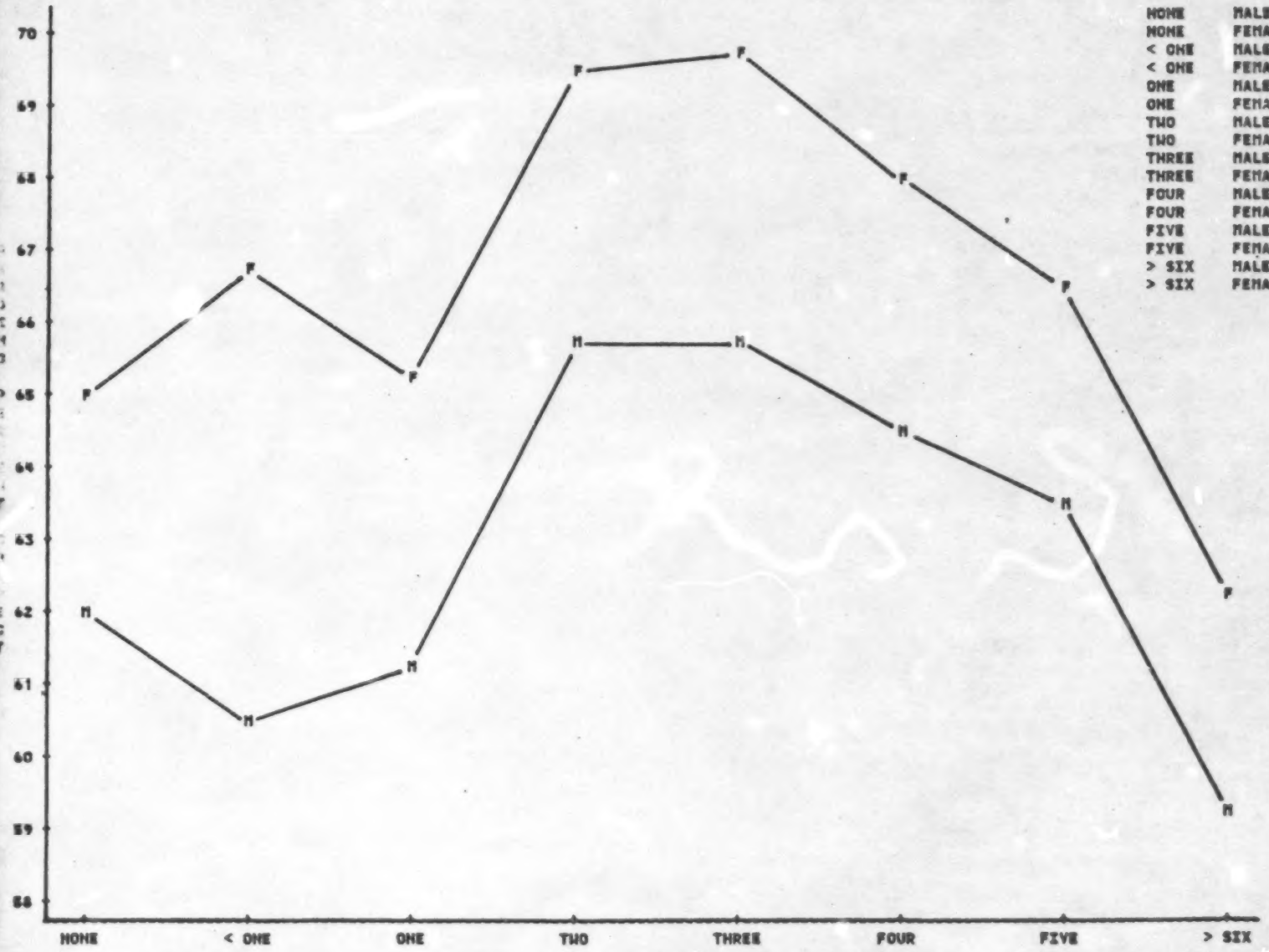


Figure 2

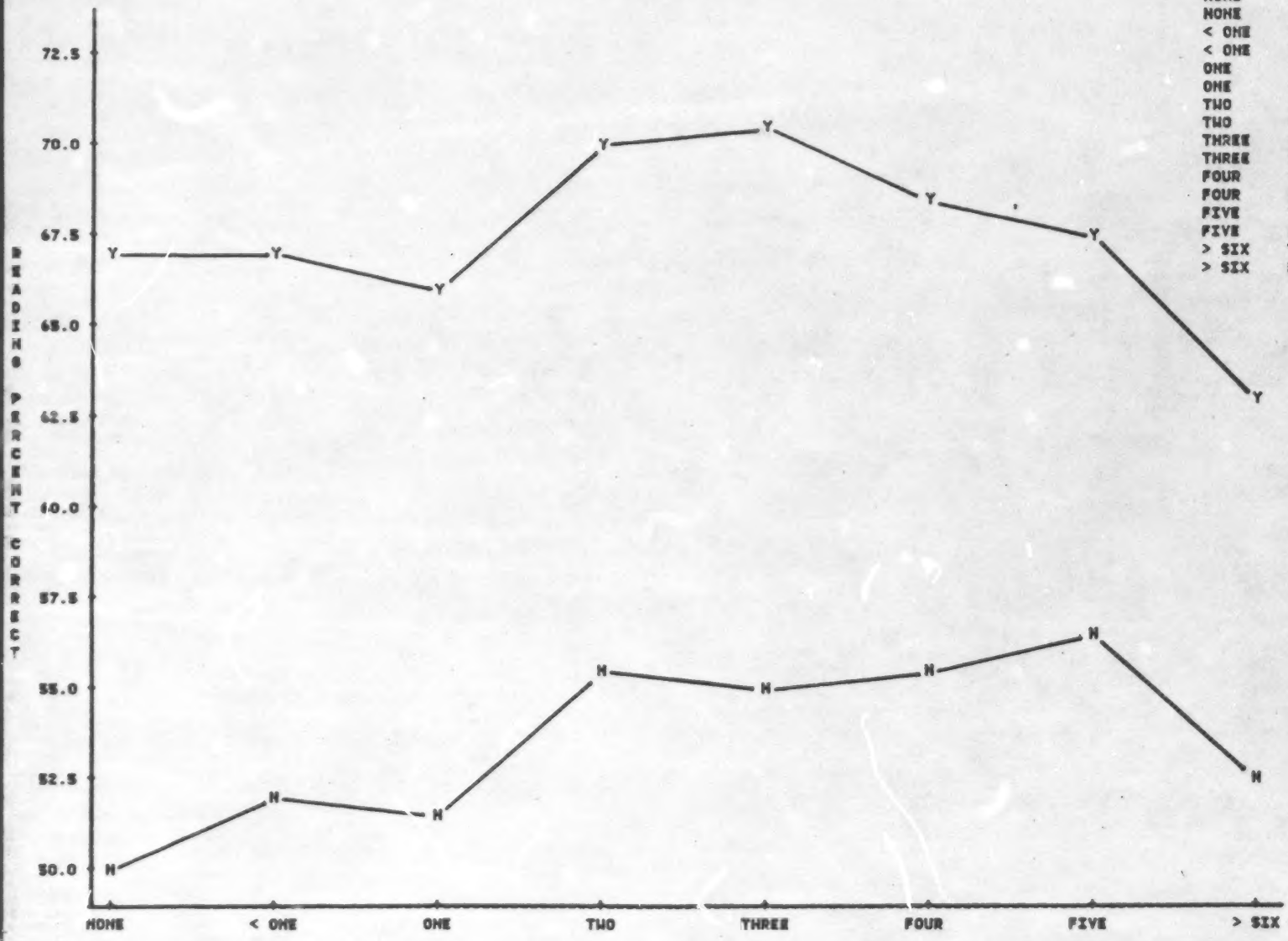
PLOT OF READING ACHIEVEMENT BROKEN DOWN BY SEX



TV	RESP	PERCENT	READING
NONE	MALE	4.2	61.9
NONE	FEMALE	4.1	64.9
< ONE	MALE	6.2	60.4
< ONE	FEMALE	7.2	66.7
ONE	MALE	5.2	61.2
ONE	FEMALE	5.6	65.2
TWO	MALE	6.5	65.8
TWO	FEMALE	7.7	69.4
THREE	MALE	6.4	65.8
THREE	FEMALE	6.7	69.7
FOUR	MALE	6.5	64.5
FOUR	FEMALE	6.7	68.1
FIVE	MALE	4.0	63.4
FIVE	FEMALE	4.1	66.6
> SIX	MALE	10.4	59.3
> SIX	FEMALE	8.6	62.2

Figure 3

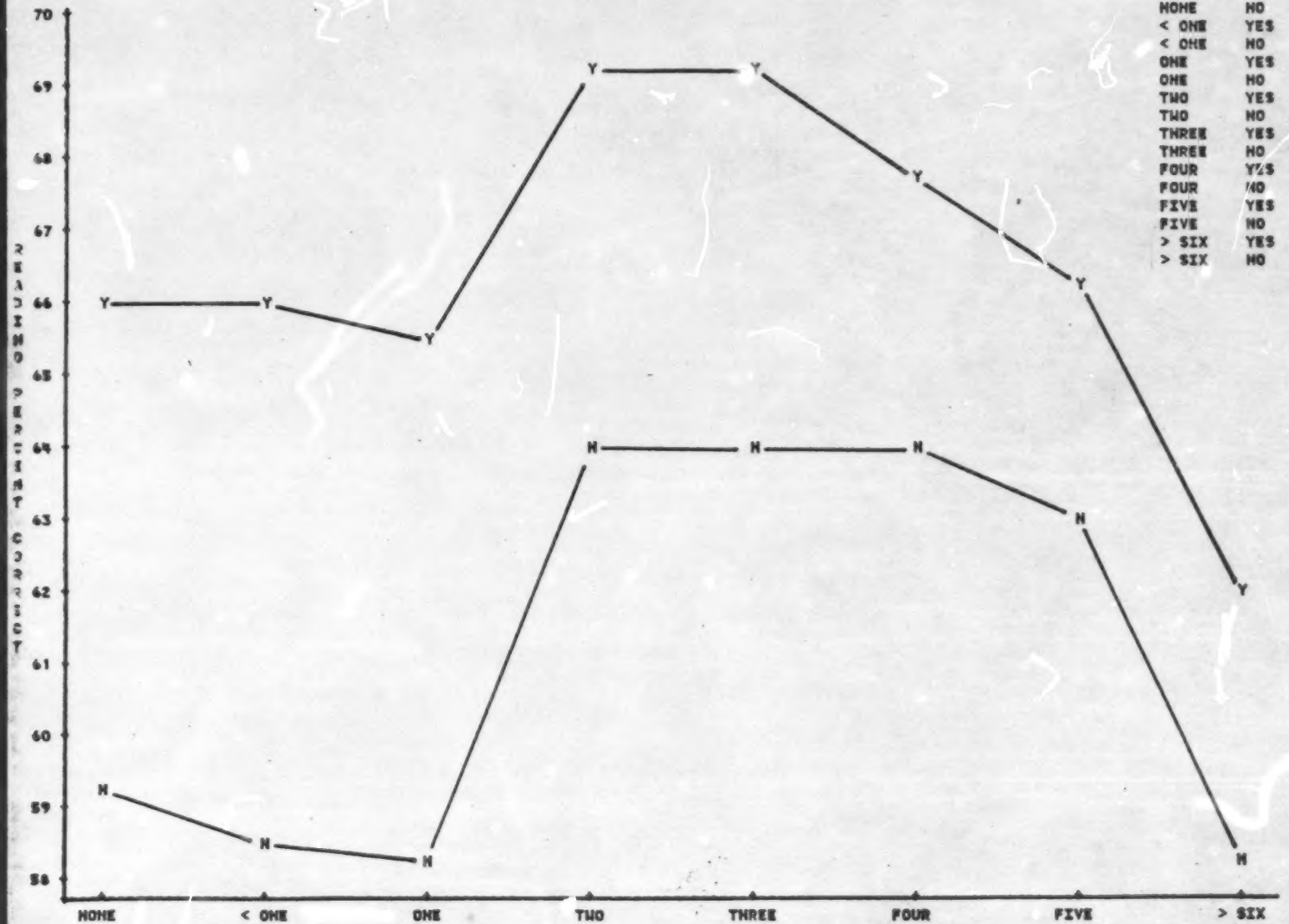
PLOT OF READING ACHIEVEMENT BROKEN DOWN BY ENGLISH IN THE HOME



TV	RESP	PERCENT	READING
NONE	YES	6.8	67.0
NONE	NO	1.5	50.1
< ONE	YES	11.0	67.0
< ONE	NO	2.3	52.0
ONE	YES	9.1	66.2
ONE	NO	1.8	51.3
TWO	YES	12.2	70.2
TWO	NO	1.9	55.3
THREE	YES	11.4	70.3
THREE	NO	1.8	55.2
FOUR	YES	11.3	68.7
FOUR	NO	2.0	55.6
FIVE	YES	6.6	67.6
FIVE	NO	1.4	56.3
> SIX	YES	15.0	63.2
> SIX	NO	4.0	52.7

Figure 4

PLOT OF READING ACHIEVEMENT BROKEN DOWN BY NEWSPAPER READING



TV	RESP	PERCENT	READING
NONE	YES	6.2	65.9
NONE	NO	1.9	59.3
< ONE	YES	10.7	65.9
< ONE	NO	2.6	58.6
ONE	YES	8.4	65.8
ONE	NO	2.4	58.2
TWO	YES	11.6	69.2
TWO	NO	2.6	63.9
THREE	YES	10.9	69.3
THREE	NO	2.3	64.0
FOUR	YES	10.7	67.7
FOUR	NO	2.7	63.9
FIVE	YES	6.4	66.2
FIVE	NO	1.7	63.0
> SIX	YES	14.5	61.9
> SIX	NO	4.4	58.3

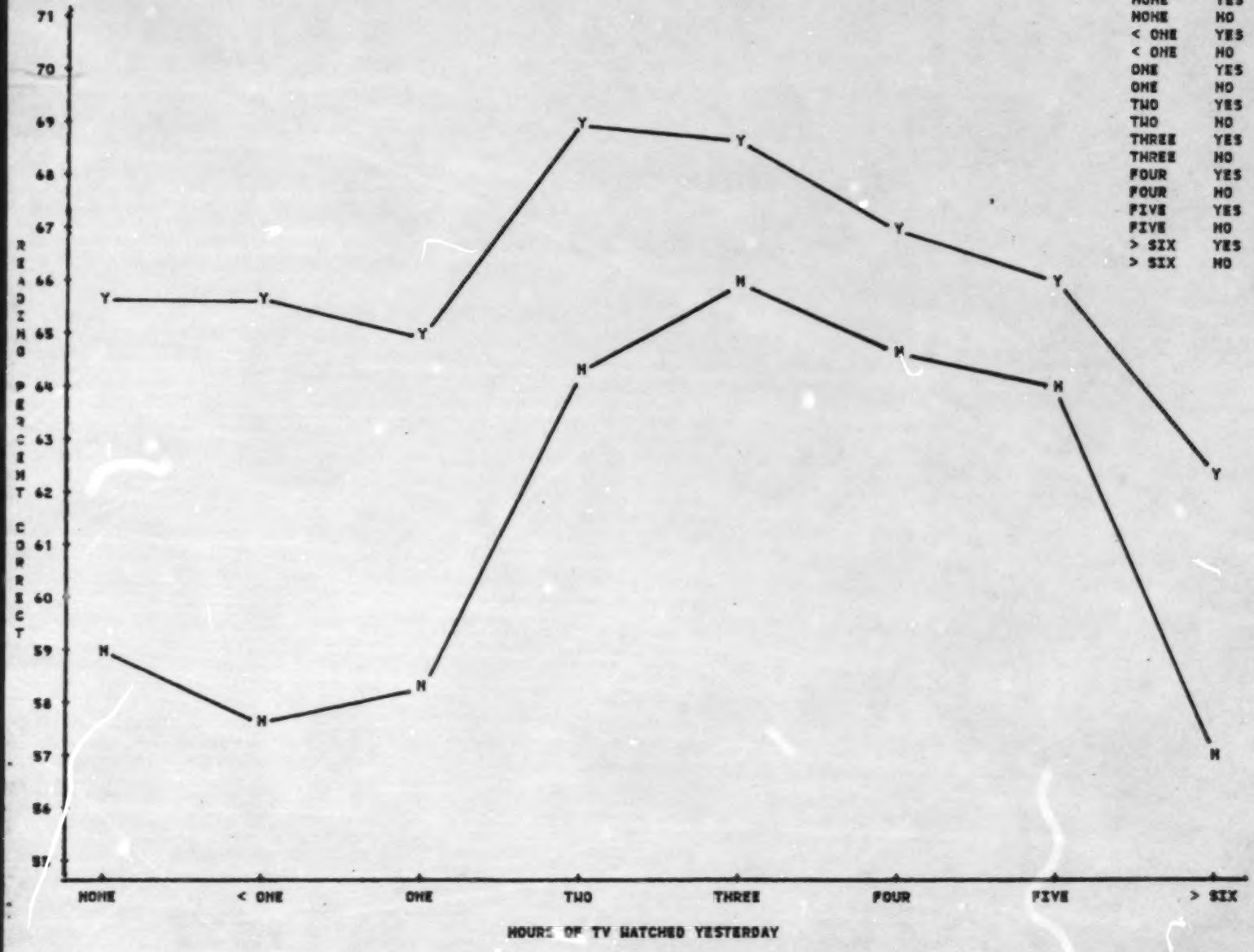
Figure 5

PLOT OF READING ACHIEVEMENT BROKEN DOWN BY AMOUNT OF BOOKS IN THE HOME

TV	RESP	PERCENT	READING
NONE	YES	7.5	65.6
NONE	NO	0.8	49.3
< ONE	YES	12.1	66.0
< ONE	NO	1.1	48.8
ONE	YES	9.8	65.4
ONE	NO	1.0	49.9
TWO	YES	13.1	69.3
TWO	NO	1.0	55.6
THREE	YES	12.6	69.0
THREE	NO	0.7	55.8
FOUR	YES	12.3	67.7
FOUR	NO	1.0	54.9
FIVE	YES	7.6	64.3
FIVE	NO	0.6	54.1
> SIX	YES	16.7	62.4
> SIX	NO	2.0	51.3

Figure 6

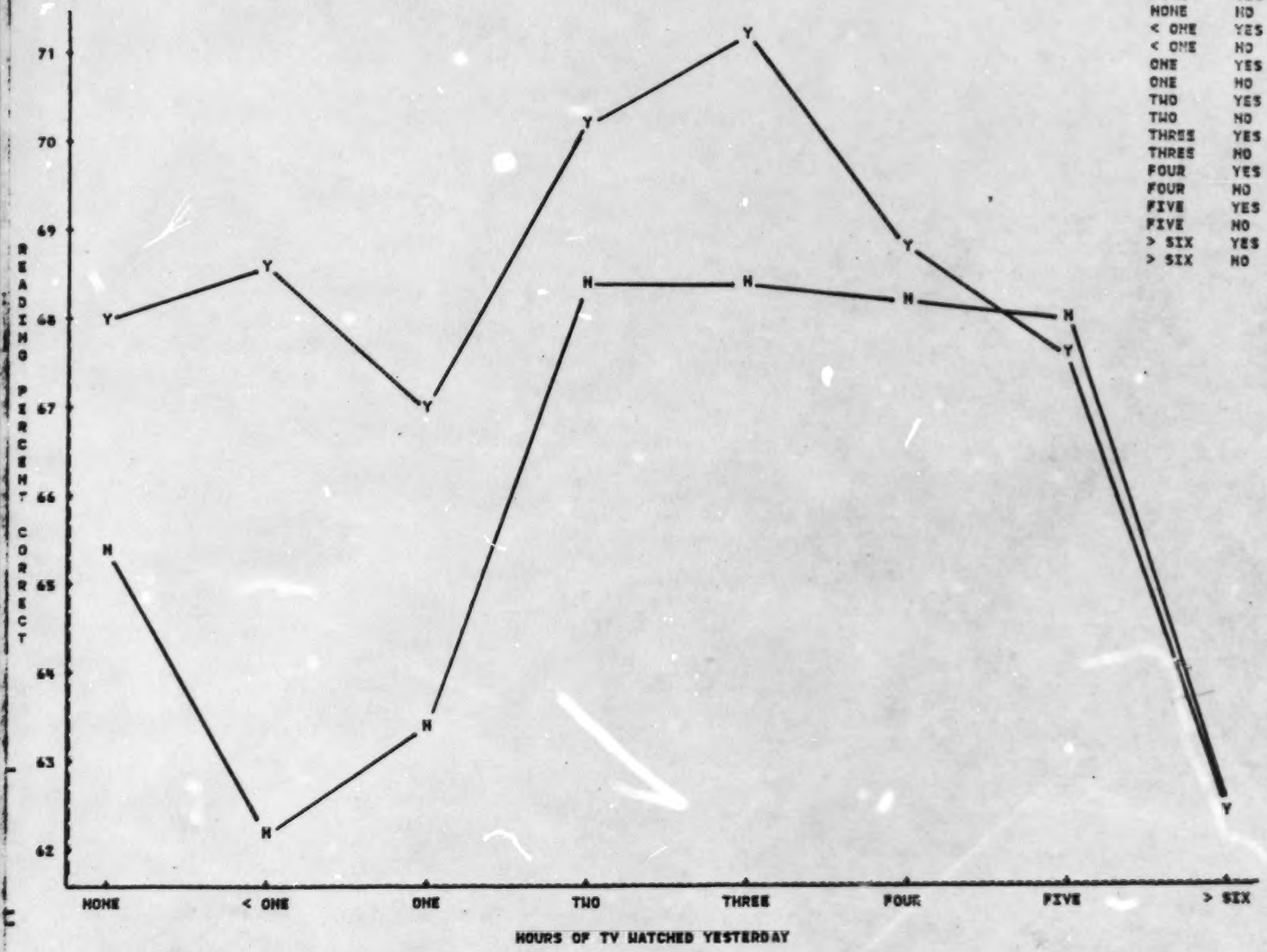
PLOT OF READING ACHIEVEMENT BROKEN DOWN BY ENCYCLOPEDIA IN THE HOME



TV	RESP	PERCENT	READING
NONE	YES	6.4	65.8
NONE	NO	1.8	59.0
< ONE	YES	10.7	65.8
< ONE	NO	2.5	57.8
ONE	YES	8.9	65.0
ONE	NO	2.0	58.4
TWO	YES	11.5	69.0
TWO	NO	2.7	64.4
THREE	YES	10.8	68.8
THREE	NO	2.4	66.1
FOUR	YES	10.9	67.1
FOUR	NO	2.5	64.8
FIVE	YES	6.4	65.9
FIVE	NO	1.7	63.9
> SIX	YES	14.4	62.4
> SIX	NO	4.5	56.9

Figure 7

PLOT OF READING ACHIEVEMENT BROKEN DOWN BY EDUCATION OF FATHER



TV	RESP	PERCENT	READING
NONE	YES	6.3	67.9
NONE	NO	2.2	65.3
< ONE	YES	9.3	68.6
< ONE	NO	4.1	62.1
ONE	YES	7.5	67.0
ONE	NO	3.5	63.4
TWO	YES	9.6	70.2
TWO	NO	4.7	68.4
THREE	YES	8.9	71.1
THREE	NO	4.6	68.4
FOUR	YES	8.7	68.7
FOUR	NO	4.9	68.1
FIVE	YES	4.6	67.6
FIVE	NO	3.1	68.0
> SIX	YES	11.0	62.4
> SIX	NO	7.0	62.4